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REDESIGNING A CAPSTONE CLASS USING SIMULATIONS, CASE STUDIES AND CRITICAL THINKING

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ABSTRACT

A capstone class is the final activity for students as they complete their undergraduate requirements. Faculty in the Business and Information Technology Department at Montana Tech of The University of Montana determined to add more rigor to the capstone class that would better prepare students as they enter the work force. A student-engagement pedagogical method was selected over the traditional lecture model. Thirty-eight students completed the redesigned class and 100% of the students felt they were better prepared to move forward as they graduated from college and begin the next stage of their lives.

INTRODUCTION

Russ Edgerton as cited by Smith, Sheppard, Johnson and Johnson (2005), was the first to introduce the concept of pedagogies of engagement in his 2001 *Education White Paper* in which he wrote:

> "Learning about things does not enable students to acquire the abilities and understanding they will need for the 21st century. We need new pedagogies of engagement that will turn out the kinds of resourceful, engaged workers and citizens that America now requires" (p.36).

Since Edgerton introduced the concept of developing pedagogies that engage students, many articles have been written that indicate engaging students with active-learning strategies deepens a student's understanding of the course concepts (Heller, Biel, Dam, & Haerum 2010; Kuh 2009; LaNasa, Cabrera, & Transgrud 2009; Zyngier 2007).

Deep learning is a process which encourages students to move past surface learning of temporarily recalling facts and ideas (Beattie, Collins, & McInnes 1997). Deep learning enables students to synthesize content so as to reach an understanding of core concepts, that permits integration of the concepts into new applications (Floyd, Harrington, & Santiago 2009; Nelson Laird, Shoup, Kuh, & Schwarz 2008). Nelson Laird et al, argued "effective learning environments are characterized by the promotion of deep approaches to learning" (p. 470), which result in students being able to assimilate the information for use in a wider and more diverse set of constructs that solve real-world problems. Students exposed to deep approaches to learning are then challenged to develop a deeper level of understanding when asked to define and communicate solutions to problems (Gindy & Tsiatas 2009).

At Montana Tech of The University of Montana, faculty in the Business and Information Technology department sought to apply the pedagogy of engagement to replace the past pedagogy of transmission for the department's capstone Strategic Management class. To apply a pedagogy of engagement, a new pedagogy would have to developed. This would prove to be a challenging process, as pedagogical approaches to teaching are typically based on the teaching style of the instructor (Smith 2010). Instructors, who see themselves as content experts use the lecture format to transmit the content and much of the teaching methods used in previous business related courses was in a teacher-centered lecture format. To apply active learning pedagogies, instructors would have to change their teaching style to foster a classroom setting which would require change of teaching paradigms (Johnson, Johnson, & Smith 2007).

Doing a literature search on active-learning strategies, student engagement, and student-centered learning activities reveals many articles on these topics, but there are few studies that discuss the faculty or student reaction to the course outcomes (Harpe & Phipps 2008). The results from this study hope to shed light on the experience of students and faculty when students are exposed to student-centered learning techniques and when faculty are asked to move past their traditional transmission pedagogies to a pedagogy of engagement.

REDESIGNING A CAPSTONE CLASS

In redesigning the capstone course, it became apparent a better understanding was needed of what is meant by a capstone. Stephen, Parente, & Browne (2002) used the analogy that like the last stone placed in the completion of a building, a capstone course in a curriculum is the last and final course before graduation. Knowing that the capstone is the last class in the curriculum before a student completes their undergraduate education provided some relief to faculty. This relief was based on the assumption that content delivered in previous courses need not be repeated. Acknowledging this gave some freedom to faculty, removing some of the guilt associated with the impression, that to teach, one must be lecturing and sharing knowledge with students.

DiCarlo (2009) argued teachers who are trying to:

> "cover the content would limit student to simply learning facts without the ability to apply their knowledge to solve novel problems. However, learning is not about committing a set of facts to memory, but the ability to use resources to find, evaluate, and apply information" (p. 258).

If teaching content is an exercise in memorizing facts to pass exams, then teaching content, according to DiCarlo (2009) does not allow time for teachers to help students "develop lifelong skills such as critical thinking, problem solving, communication and interpersonal skills" (p. 258).

To implement a pedagogy of engagement, the teacher-student relationship would have to change from the teacher sharing content knowledge, to the student demonstrating their ability to actively apply previously learned concepts. Instead of the teacher being in the prominent role of leading the class, the students would now be asked to become actively engaged through a variety of problem-based and collaborative learning activities. It was expected this could create a great deal of anxiety for students who were more comfortable being told what to know. Instead, the tables would be turned on the students by asking them to tell what they know. The expectation was to take the students out of their comfort zone of sitting in a classroom during the typical lecture while waiting for the bell to ring and instead make them responsible for the class discussion, and ultimately what is learned. What students did not know, was this change in pedagogy was going to place a great deal of anxiety on the instructors as well as they too moved out of their comfort zone of a controlled classroom environment using lectures, to a less-controlled environment where the class outcomes were unknown.

The assessments for the class were going to be a combination of problem-based learning (PBL) activities, process-oriented guided inquiry learning (POGIL), and collaborative learning activities. The PBL activities included the analysis of five Harvard Business School cases. The POGIL activities included students being assigned nine different strategic management concepts which required students to write individual topical research papers. The collaborative learning activity was a computer-based business simulation that required students to manage a company, analyze the results, and defend their decisions in two presentations to a board of directors comprising faculty and business leaders in the community.

Course learning objectives

From the course syllabus, the stated capstone course learning objectives were:

1. To develop the capacity to think critically and strategically about a company, its present business position, its long-term direction, its resources and competitive capabilities, the caliber of its strategy, and its opportunities for gaining sustainable competitive advantage.
2. To build skills in conducting strategic analysis in a variety of industries and competitive situations and, especially, to provide a stronger understanding of the competitive challenges of a global market environment.
3. To provide for a hands-on experience in crafting business strategy using business simulations, to

reason carefully about strategic options, using what-if analysis to evaluate action alternatives and marking sound strategic decisions. This is what we call active learning, and this learning only takes place with student involvement.

4. To acquaint students with the managerial tasks associated with implementing and executing company strategies, Harvard Business case studies will be used as problem-based activities to give students the opportunity to comprehend the range of actions managers can take to promote competent strategy execution in real-life situation, while instilling confidence to students they can effectively contribute as part of a company's strategy-implementation team.
5. To integrate the knowledge gained in earlier courses in the business department curriculum applying the process-oriented guided individual learning, which allows students to demonstrate how the various pieces of the business puzzle fit together, and why the different parts of a business need to be managed in strategic harmony for the organization to operate in a winning fashion.
6. To heighten awareness of how and why ethical principles, core values, and socially responsible management practices matter greatly in the conduct of a company's business.
7. To develop powers of managerial judgment, learn how to assess business risk, and demonstrate how to make sound business decisions and achieve effective outcomes.

Following this course, the student will demonstrate:

1. Improved oral and written communication skills.
2. Improved quantitative and critical thinking skills.
3. Understanding the importance of strategy and comparative advantage in the business world.
4. The ability to use of various analytical tools such as Microsoft Excel for modeling business decisions.
5. The skill to develop and recommend a chosen strategy.
6. The ability to apply related concepts, theories, and procedures used in all other Montana Tech business related course work.

Problem-Based Learning (PBL)

After students graduate from college they will be asked to solve real world problems in their workplaces. By preparing students for what they will face after graduation, problem-based learning gives them an opportunity to develop the skills they will need in the future (Dunlap 2005). To create the problem-based learning environment for this course, five Harvard Business School case studies on marketing, finance, human resource management, supply chain management and the balanced scorecard were selected. Case studies provide not only problem-based learning, but also active learning as students are asked to apply what they have learned in their core courses to real-world situations (Mitchell 2004). The cases selected not only gave students the chance to apply problem-based learning, but also required the use of quantitative modeling to identify and understand fully the breadth and depth of the problems facing each company. Even though students in the Business and Information Technology department are required to take a Microsoft Excel and business applications course, it became apparent students required additional coaching in learning how to build models that would help explain outcomes. A takeaway from this was the need for students to develop better critical thinking skills to learn how to setup the decision model.

Process-Oriented Guided Inquiry Learning (POGIL)

Instead of using a textbook, nine different topics related to Strategic Management were selected including how to deal with competitors, internal success factors, decision making, leading change, increasing shareholder responsibility, corporate social responsibility, the balanced scorecard and the future of capitalism. Students were asked to find academic articles published in peer-reviewed journals related to each of these topics, write an evaluation of the article and come to class prepared to participate in an open forum where the topic was discussed, challenged, questioned, debated, evaluated, analyzed and critiqued. There were 38 students in the class and the expectation was that each student would make a contribution to the discussion for each of these topics.

To facilitate group discussions, students were randomly assigned to small groups of four students, or divided into two large groups, or gathered as one large group in a circle. THINK-PAIR-SHARE and THINK-PAIR techniques were used to engage students, which allowed them to share their ideas with smaller groups (Kotru, Burkett & Jackson 2010). According to Tanner (2009), "the role of talking in learning by postulating that a cognitive process underlying talk, termed self-explanation, facilitates the integration of new knowledge into existing knowledge" (p. 90). Initially students were unsure of what was expected of them as they had not previously been asked to be responsible for their learning. What impressed faculty was how quickly students stepped in to take responsibility for the discussion. What faculty feared, which was the loss of controlling the conversation, quickly became a strength as students who were silent in previous classes, were now engaged in discussions. It seemed students were more willing to be engaged when talking informally to each other in small groups, then when they were talking to a question posed by a faculty member when the classroom had a more formal lecture setting.

Collaborative Learning

In addition to case analysis, a computer-based business simulation game from GLO-BUS software was selected as another problem-based learning activity for the class. Computer simulations have become a very popular learning tool for strategic management courses across the country, and 97% of schools accredited by the Association to Advance Collegiate Schools of Business (AACSB) use simulations in their courses (Mitchell 2004). Dewey as cited by Mitchell (2004) stated that:

> "methods that are successful in formal education…will reveal that they depend for their efficiency upon the fact that they go back to the type of situation which causes reflection out of school in ordinary life…They give the pupil something to do, not something to learn, and the doing is of such a nature as to demand thinking" (Dewey 1966, p. 154).

Setting the Expectations for the Course

Students were advised when they registered for the class that it would be more intensive and rigorous any class previously completed. The previous two offerings of the course were taught using the business simulation and smaller case studies from a strategic management text, had already let students know via the grapevine that they needed to be prepared for a class that would require a significant commitment in time for completing course materials. Students were also informed this was not a class they could skip as attendance was mandatory. An escalating number of points would be deducted from the final course grade for missing up to four class sessions. A student missing a fifth class would automatically fail the class. Students learned in the first class session that the format of the class would eliminate the typical sitting in the class and saying nothing, by giving students numerous opportunities to discuss class concepts. According to Tanner (2009), students who are asked to explain course content had stronger learning outcomes, than students who simply summarized the material.

Nearly 20% of the students had previous experience completing Harvard case studies and knew how to analyze, prepare, write and discuss a business case. For those new to the case experience, a practice case was introduced and students were taught how to read for content, not just for completion. The reason for doing this was to overcome the tendency of students to state they did not know how to read and identify the problems in the case. Bashir and Hook (2009) argued "reading is a complex process" (p. 197) and when readers encounter words which are unfamiliar, the hope is further reading will provide the context needed to provide meaning. For students, motivation to continue reading is reduced when factors of complexity and lack of understanding of what is being read, creates a dislike for the material (Bashir & Hook 2009).

Students completing a capstone course are expected to demonstrate their mastery of subject matter taught in previous courses. The challenge for students completing any class is to recall information learned in previous classes and be able to apply it to new applications (Armbruster, Patel, Johnson, & Weiss 2009; Kuh 2009; Nelson Laird et al 2008). This expectation sounds reasonable, but for many students, the moment they complete a class, the knowledge presented in the class is gone (Heller et al 2010; Zyngier 2007). This problem is identified by Mayer (2002) as either rote or meaningful learning, that knowledge can be retained long enough to take an

exam, but not deep enough so the knowledge can be transferred to new problem solving applications.

Results of changes in the capstone class

The redesign of the capstone was to actively engage students with a variety of assessments. Students were introduced to critical thinking methods, Socratic questioning methods, problem-based learning methods with case studies, process-oriented guided inquiry methods with topical discussion papers, and collaborative learning methods using computer based business simulations. Of the 38 students in the class, 33 students completed questionnaires with the results identified in Table 1 items a - d. Item e results were completed by 24 students.

Table 1. Student Observations of the Strategic Management Course offered at Montana Tech, Spring 2011
Likert Scale Responses

	Mean(SD)[a]	Range[a]	% Disagree[b]	% Agree[c]
I enjoy the lecture style of classroom teaching.[d]	3.6(0.8)	2 - 5	9.1	60.6
I learn best in a classroom environment were the instructor uses PowerPoint and I sit and take notes.[d]	2.9(1.0)	1 - 5	33.3	33.3
I have been exposed to critical thinking in classes throughout my years in college.[d]	3.2(0.9)	2 - 5	30.3	42.4
My exposure to critical thinking in this class is similar to how critical thinking has been taught in other classes.[d]	2.5(1.0)	1 - 5	54.5	12.1
Having been exposed to a class that was structured around critical thinking, I found that I looked forward to coming to class.[d]	3.0(1.1)	1 - 5	33.3	36.4
I would have liked to have taken a class on critical thinking and decision making earlier in my career at Montana Tech.[d]	4.1(0.9)	2 - 5	9.1	84.8
I would recommend that more classes be taught using this method of instruction that involves the student in their learning.[d]	3.9(0.9)	2 - 5	9.1	66.7
The instructor encourages class discussion/participation.[e]	4.6(0.6)	3 - 5	0.0	95.7
The instructor asks questions of the students.[e]	4.7(0.5)	4 - 5	0.0	100.0
The instructor is willing to listen to student questions and opinions.[e]	4.6(0.5)	4 - 5	0.0	100.0
The instructor has a concern for the quality of teaching and learning.[e]	4.6(0.5)	4 - 5	0.0	100.0
The instructor encourages students to challenge themselves and do high quality work.[e]	4.7(0.5)	4 - 5	0.0	100.0
The quality of teaching was very effective in contribution to my learning.[e]	4.4(0.8)	2 - 5	4.3	91.3

[a] Student observations were measured using a Likert scale with the following breakdown: 1 "Strongly disagree", 2 "Disagree", 3 "Neutral" 4 "Agree", and 5 "Strongly agree"

[b] % Disagree represents the percentage of those students who responded with either 2 "Disagree" or 1 "Strongly Disagree"

[c] % Agree represents the percentage of those students who responded with either 4 "Agree" or 5 "Strongly Agree"

[d] Results taken from a student survey written specifically for the Strategic Management class (sample size = 33)

[e] Results taken from a the general student survey required for all courses at Montana Tech (sample size = 24)

Table 2. Student Observations of the Strategic Management Course offered at Montana Tech, Spring 2011
Non Likert Scale Responses (N = 33)

	% Yes	% No	% No response
Do you believe you are able to demonstrate the outcomes of this course after the successful completion of this course?	100.0	0.0	0.0
Were you prepared for the amount and type of work required in this course?	54.5	27.3	18.2
This course attempted to avoid a traditional lecture format. Did you prefer the format of this course as compared to the traditional lecture format?	97.0	3.0	0.0
Do you believe this course, the department capstone course, properly prepared you for either entry into the workforce or into graduate school?	97.0	3.0	0.0

CONCLUSIONS

At the conclusion of the class, 33 out of 38 students completed the end of class survey. Eighty-five percent of the students said they would have liked to have taken a class in critical thinking and decision making earlier in their college career while 67% of students would like to see more classes taught using active-learning strategies. Ninety-one percent of the students felt the style of teaching used in the class was an effective method to help them learn.

Ninety-seven percent of students said they preferred the active-learning format of this class as compared to traditional lecture based classes, 97% said the course had prepared them for entry into the workforce and 100% of the students said following the class they were now able to demonstrate the outcomes that were listed at the start of the class.

Students were allowed to offer additional insight regarding their observations for the course. A number of students explained their perceived lack of preparedness to the course. Of students saying they were not prepared for the course, eleven students wanted to be introduced to critical thinking prior to the course, six students wanted more experience in Microsoft Excel, and nine students stated that prior experience to the case study method would be beneficial before enrolling in the course. Of those students responding in favor of the redesigned course, fourteen expanded their answer with positive comments such as "this format was great" to "I loved this approach." Three students went on to say that they believed this format added stress.

An informal review of the outcomes by the faculty, bolstered by the student survey, led the faculty to conclude;

1. The revamped pedagogy should be retained with even greater emphasis placed on student-engagement and student-led learning activities.
2. The pedagogy used in the capstone course should be adopted and used in other senior, (and eventually junior) level courses in the curriculum.
3. The ties between skill-building courses (for example, Microsoft Excel) and the building of business and other analytical models should be strengthened.
4. A renewed emphasis on the development of critical thinking skills and their application to the business workplace.

Further Considerations for Faculty

Faculty are often overwhelmed by the sheer volume of content embedded in most courses and struggle in the attempt to cover some expected percentage of content. Faculty often resort to lecture after lecture in a race with the semester calendar.

Unfortunately, what often results is a diminution of learning on the part of the students in spite of the best efforts of teachers. What was learned in this experience with the capstone class is that less is really more with student-engagement activities resulting in greater learning, even though it seemed less content was introduced by faculty.

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